



PCT / SE 2004 / 000972

17-06-2004



INVESTOR IN PEOPLE

The Patent Office  
Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

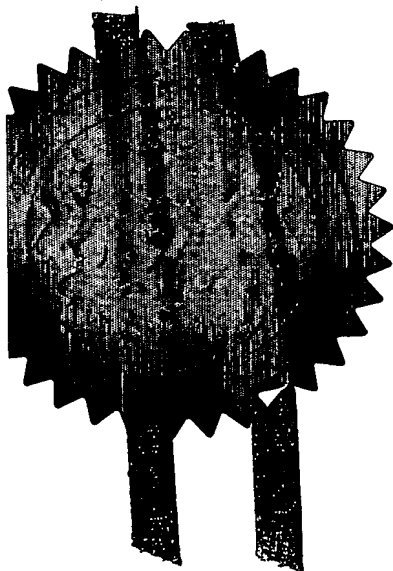
REC'D 07 JUL 2004	
WIPO	PCT

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed *AmBrenes*

Dated 13 April 2004

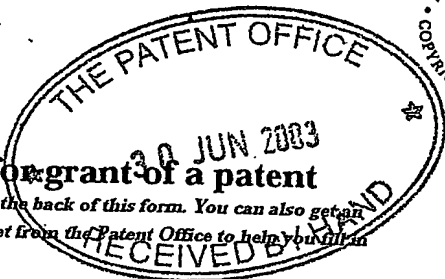
**PRIORITY  
DOCUMENT**  
SUBMITTED OR TRANSMITTED IN  
COMPLIANCE WITH RULE 17.1(a) OR (b)

# Patents Form 1/77

Patents Act 1977  
(Rule 16)



Notice  
1/77



## Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ

1. Your reference

P17744GB-SJP/mm

2. Patent application number

(The Patent Office will fill in this part)

0315270.9

01JUL03 E819009-1 000389  
P01/7700 0.00 0315270.9

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Autoliv Development AB  
S-447 83 Vargarda  
SWEDEN

Patents ADP number (if you know it) 00321018009

If the applicant is a corporate body, give the country/state of its incorporation

SWEDEN

4. Title of the invention

IMPROVEMENTS IN OR RELATING TO AN AIR-BAG

5. Name of your agent (if you have one)

Forrester Ketley & Co.

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Forrester House  
52 Bounds Green Road  
London  
N11 2EY

Patents ADP number (if you know it)

133001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

YES

**Patents Form 1/77**

9. Enter the number of sheets for any of the following items you are filing with this form.  
Do not count copies of the same document

Continuation sheets of this form

Description	9
Claim(s)	2
Abstract	1 DL
Drawing(s)	3 TB

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

ONE

Request for substantive examination (*Patents Form 10/77*)

Any other documents  
(*please specify*)

11. I/We request the grant of a patent on the basis of this application.

Signature  
*Forrester Kelley & Co.*

Date  
30 June 2003

12. Name and daytime telephone number of person to contact in the United Kingdom
- S.J. PARRY  
(020) 8889 6622

**Warning**

*After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.*

**Notes**

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.*
- Write your answers in capital letters using black ink or you may type them.*
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.*
- Once you have filled in the form you must remember to sign and date it.*
- For details of the fee and ways to pay please contact the Patent Office.*

PATENTS ACT 1977

P17744GB - NHF/SJP/jw/va/aw

5

**DESCRIPTION OF INVENTION**

10 **"IMPROVEMENTS IN OR RELATING TO AN AIR-BAG"**

**THE PRESENT INVENTION** relates to an air-bag for use in a vehicle such as a motor car and more particularly relates to a side air-bag.

15

A side air-bag may be mounted in position, for example, in the backrest of a vehicle seat or in part of the side wall or a side door of the motor vehicle, the air-bag being configured, when inflated, to be located between the occupant of a seat and the adjacent side of the vehicle.

20

A side air-bag may prove to be of particular benefit in a side impact situation. However, in a side impact situation an intruding vehicle or object can, even at relatively low speeds, impact with an occupant of the vehicle very shortly after the impact situation has commenced, and consequently it is desirable to be able to inflate a side air-bag in the minimum amount of time. Consequently it is desirable to be able to inflate the side air-bag using a minimum quantity of gas.

25

However, it is also desired that a side air-bag should be as thick or "deep" as possible in the traverse direction across the vehicle, in order to provide the maximum cushioning effect for the occupant of a vehicle relative to an intruding vehicle or object.

5

Consequently it is desired to provide a side air-bag which can be inflated quickly using a minimum quantity of gas, but which has a relatively high thickness or "depth".

10

The present invention seeks to provide an improved side air-bag.

15

According to the present invention, there is provided a side air-bag for use in a motor vehicle, the side air-bag being formed from two superimposed layers of a laminar material, each layer having a leading edge and a trailing edge, there being at least one internal tether having opposed ends connected to the leading edge and the trailing edge, the length of the tether between the connections being less than the width of the said layers forming the air-bag between the said connections.

20

Preferably when the side air-bag is mounted in the motor vehicle, the or each tether is configured to extend in a direction substantially parallel to the longitudinal axis of the motor vehicle when the air-bag is inflated.

25

Advantageously there is a single tether.

Conveniently there are at least two tethers at spaced apart positions.

Preferably the air-bag is divided into two separate internal inflatable chambers by means of a seam interconnecting the said layers of laminar material.

5      Advantageously the width of each said layer of laminar material at the point where the tether is provided is  $W$  and the length of the or each tether is  $d$ , wherein  $d < 2W/\pi$ .

10      In order that the invention may be more readily understood, and so that further features thereof may be appreciated, embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

15      Figure 1 is a plan view illustrating two components for forming an air-bag.

Figure 2 is a view of an air-bag formed from the components of Figure 1 illustrating additionally a gas generator and deflector;

20      Figure 3 is a view of a modified embodiment to the invention; and

Figure 4 is a view of a modified air-bag similar to that shown in Figure 2.

25      Referring initially to Figure 1 of the accompanying drawings, an element 1 of flexible laminar material such as fabric, is illustrated. It is to be understood that two components of the shape and form of the element 1 are to be superimposed and joined together to form an air-bag. Alternatively a single

---

component of appropriate shape may be folded about a fold line to provide the two superimposed elements.

The element 1 has a central substantially rectangular region 2 with rounded corners. The rectangular region 2 has a leading or forward edge 3 and a trailing or rearward edge 4. The forward edge 3 forms that part of the air-bag which will be towards the front of the vehicle when the air-bag is in position in the vehicle and inflated, and the rearward edge 4 is the edge of the air-bag which will be towards the rear of the vehicle when the air-bag is in position in the vehicle and inflated.

The rearward or trailing edge 4 is provided with a rearwardly projecting portion 5 located substantially at its mid point. The projecting portion 5 is provided with two apertures 6, 7 therein at spaced apart positions.

The overall width of the element 1, from the leading edge 3 to the trailing edge 4 is a width W.

A further component 8 is illustrated in the form of a tether. The component 8 is a rectangular element of flexible laminar material such as fabric. The element has a length d, the length d being such that, preferably,  $d < 2W/\pi$ .

In fabricating an air-bag, two elements such as the element 1 are superimposed, with a tether 8 inserted between them. The two superimposed elements are interconnected by means of a peripheral seam 9 as shown in Figure 2 which extends around the periphery of the superimposed elements 1 except for the region at the end of the rearward projection 5 formed in the

trailing edge 4 of the superimposed layers. The internal tether 8 is secured, adjacent the rearward projection 5, to at least one of the layers 1 by the stitching the seam 9, or forming the seam 9 using some other technique. The leading or forward edge 3 of each element 1 is slightly back towards the trailing edge 4 as the air-bag is fabricated so that the leading or forwardmost edge of the tether 8 may be trapped in the region of the seam adjoining the leading or forward edges of the elements 1. The two elements, at least in the region of the tether, will be wrinkled and will not lie flat. It is to be understood that the width of the fabric of the elements between the points at the leading and trailing edge, where the tether is secured to the fabric, is greater than the length of the tether between said points, which means that some wrinkles or folds must be present in the fabric.

A cylindrical gas generator 10 may be provided to be mounted within the air-bag, the gas generator 10 having a cylindrical body 11 with two parallel and radially extending studs 12, 13. The cylindrical body 11 may be provided with gas outlet apertures 14. In conjunction with the gas generator 10, a protecting element or gas diffuser 15 may be provided, the protecting element 15 being of open-channel-form and being provided with two apertures 16, 17 located and configured to receive the studs 12, 13. The protector 15 may be mounted on the studs 12, 13 of the gas generator 10 to form a gas generator unit and the thus-assembled gas generator unit may be inserted into the air-bag through the opening formed by the un-connected peripheral parts of the superimposed elements 1 in the region of the co-aligned rearward projections 5. When the gas generator unit has been inserted into the air-bag, the studs 12, 13 may be passed through the apertures 6, 7 in each of the projections 5, thus effectively sealing the air-bag.



The air-bag, as thus described, may be mounted in a motor vehicle at a suitable position for the air-bag to act as a side air-bag, and thus the air-bag may be mounted in the backrest of a vehicle seat or in part of the side wall of the vehicle adjacent a vehicle seat.

5

On deployment of the air-bag, gas from the gas generator will be injected into the air-bag. The effect of the tether 8 will be to prevent the forward or leading edge 3 of the air-bag from moving a substantial distance in the x direction (or main longitudinal axis) of the motor vehicle (as indicated in  
10 Figure 2) from the rear or trailing edge 4, thus forcing the air-bag to adopt a pre-determined shape on inflation. It should be appreciated that the x-direction is the direction of forwards travel of the motor vehicle. In the absence of an internal tether, such as the tether 8, the air-bag, if sufficient gas is injected into it, would tend to adopt a generally cylindrical format. However, in view of the  
15 presence of the tether, the leading or forward edge 3 of the air-bag cannot move sufficiently far away from the rear or trailing edge 4 in the x direction to form a cylinder, but instead the air-bag is inflated to have a very substantial thickness or depth in the orthogonal y-direction (transverse with respect to the longitudinal axis of the motor vehicle), whilst not extending very far forwards  
20 relative to the gas generator. The y-direction is shown in Figure 2 extending out of the page. The air-bag thus provides an optimum dimension in the direction where energy is to be absorbed.

Figure 3 illustrates a modified embodiment of the invention. Figure 3  
25 shows a complete air-bag 20 which is formed from two substantially identical superimposed elements 21, 22, of flexible laminar material such as fabric although the air-bag could be formed using a one piece weaving technique. The air-bag is provided with a peripheral outer seam 23 interconnecting the elements 21, 22, and presents a leading edge 24 and a trailing edge 25 in a

similar manner to the above-described embodiment of figures 1 and 2. The trailing edge 25 of the air-bag 20 is provided with a slit or opening 26 through which a gas generator may be inserted into the interior of the air-bag. The air-bag is also provided with two spaced apart apertures 27, 28 adjacent the slit 26, which are dimensioned to accommodate the studs of a gas generator assembly, equivalent to the studs 12, 13 of the gas generator 10 described with reference to Figure 2.

The air-bag, in the described embodiment, is divided into two separate internal inflatable chambers 28, 29 by means of an internal seam 30 interconnecting the elements 21, 22.

Two tethers 31, 32 are provided on the interior of the air-bag 20, and again each tether 31, 32 is such that the length of the tether extending between points of the leading edge 24 and the trailing edge 25 where the tether is connected to the fabric elements 21, 22 is less than the width of each of the fabric elements 21, 22 between said points. Again the purpose of the tethers 31, 32 is to ensure that the air-bag has an appropriate configuration when it is inflated, in a generally similar manner to the embodiment of figures 1 and 2.

The two tethers 31, 32 of the embodiment of figure 3 can either be configured to be of equal length to one another or such that they are of unequal lengths (as illustrated in figure 3). By varying the relative lengths of the two tethers 31, 32, different inflation characteristics can be imparted to the airbag 20.

Figure 4 shows an air-bag 40 which is similar to the air-bag shown in Figure 2, the air-bag being provided with an internal tether 41 which extends diagonally from the forward or leading edge to the trailing edge. In this

embodiment, although the tether 41 may have a length which is greater than the width of the air-bag, measured horizontally, nevertheless, the length of the tether between the end parts which connected, respectively, to the leading edge and the trailing edge of the air-bag is less than the width of each of the two  
5 layers forming the air-bag extending between the said two connections. Thus again the fabric of the air-bag is initially wrinkled or folded due to the fact that the length of the tether between the connections is less than the length of the fabric elements between the connections.

10 In each of the above-described embodiments, it is to be appreciated that the or each tether is only connected to the fabric elements of the air-bag at opposed ends of the tether, so that, when the air-bag is inflated, the tether extends across the interior of the air-bag.

15 Whilst the invention has been described with reference to embodiments in which the tethers are connected to the air-bag by having parts of the tether trapped between superimposed elements of fabric or the like which are then secured by stitching, with the stitching "trapping" the ends of the tethers, the tethers could be held in position in other ways, for example by using an  
20 adhesive.

In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

25 The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any

---

combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

5

1. A side air-bag for use in a motor vehicle, the side air-bag being formed from two superimposed layers of a laminar material, each layer having a leading edge and a trailing edge, there being at least one internal tether having opposed ends connected to the leading edge and the trailing edge, the length of  
10 the tether between the connections being less than the width of the said layers forming the air-bag between the said connections.

15

2. A side air-bag according to Claim 1 when mounted in a motor vehicle, wherein the or each tether is configured to extend in a direction substantially parallel to the longitudinal axis of the motor vehicle when the air-bag is inflated.

20

3. A side air-bag according to Claim 1 or Claim 2 wherein there is a single tether.

4. A side air-bag according to Claim 1 or Claim 2 wherein there are at least two tethers at spaced apart positions.

5. An air-bag according to any one the preceding Claims wherein the air-  
25 bag is divided into two separate internal inflatable chambers by means of a seam interconnecting the said layers of laminar material.

6. An air-bag according to any one of the preceding Claims wherein the width of each said layer of laminar material at the point where the tether is provided is  $W$  and the length of the or each tether is  $d$ , wherein  $d < 2W/\pi$ .

5 7. An air-bag substantially as herein described with reference to and as shown in Figures 1 and 2 of the accompanying drawings.

8. An air-bag substantially as herein and described with reference to and as shown in Figure 3 of the accompanying drawings.

10

9. An air-bag substantially as herein and described with reference to and as shown in Figure 4 of the accompanying drawings.

10. Any novel feature or combination of features disclosed herein.

15

**ABSTRACT****5 "IMPROVEMENTS IN OR RELATING TO AN AIR-BAG"**

10 A side air-bag for use in a motor vehicle is disclosed. The side air-bag is formed from two superimposed layers (1) of a lamina material such as fabric. Each layer (1) has a leading edge (3) and a trailing edge (4). The air-bag includes at least one internal tether (8) which extends from the leading edge (3) to the trailing edge (4), with the length  $d$  of the tether being less than the width  $D$  of the elements (1) forming the airbag between the leading edge (3) and a  
15 trailing edge (4) at a point where the tether (8) is positioned.

FIGURE 2



1/3

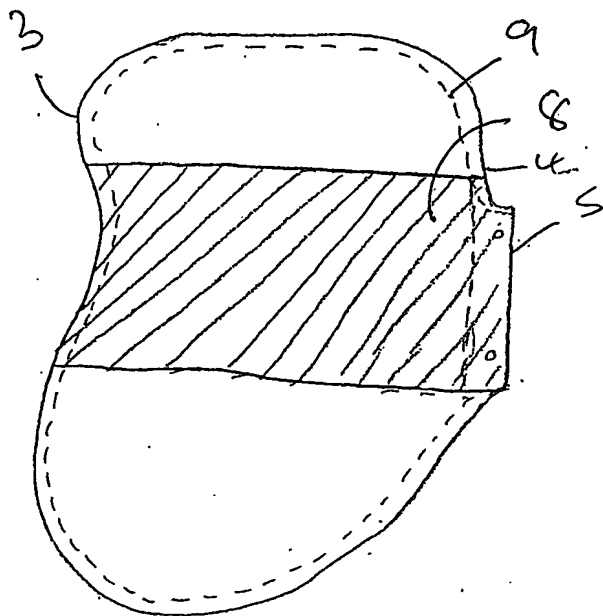
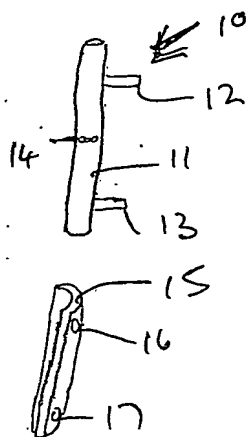
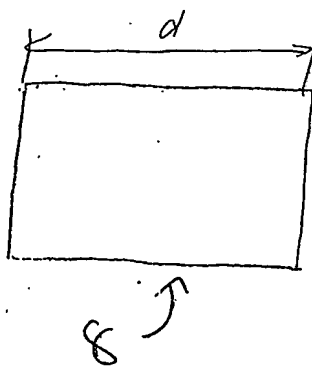
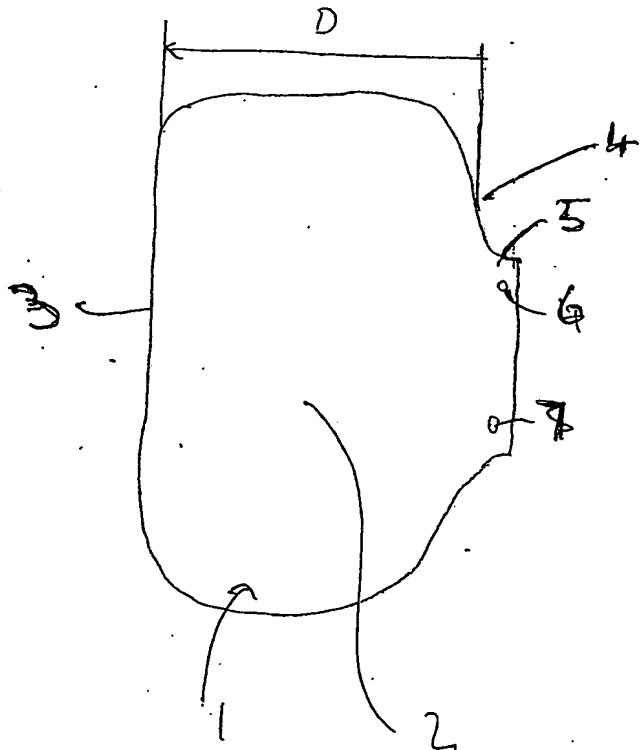


Fig. 2



X ← 07

Fig. 1





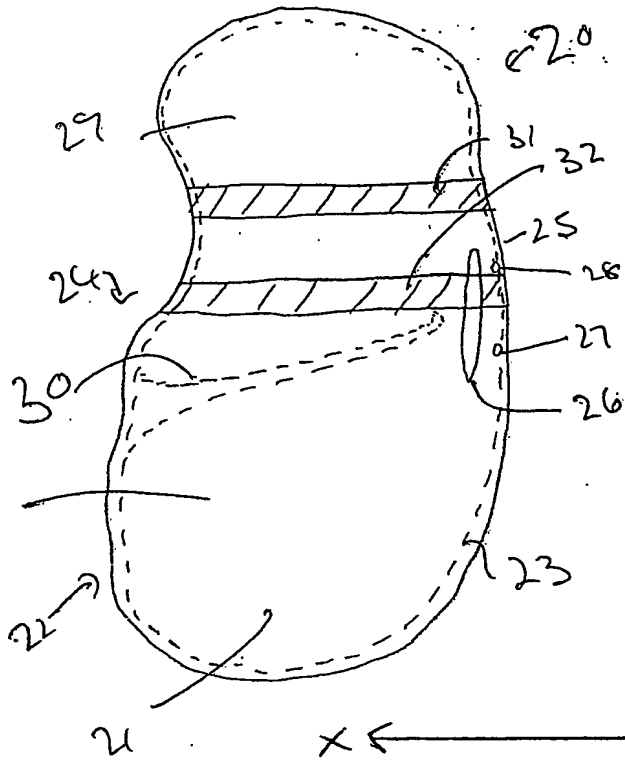


Fig. 3

X ← ⊙ 7

40

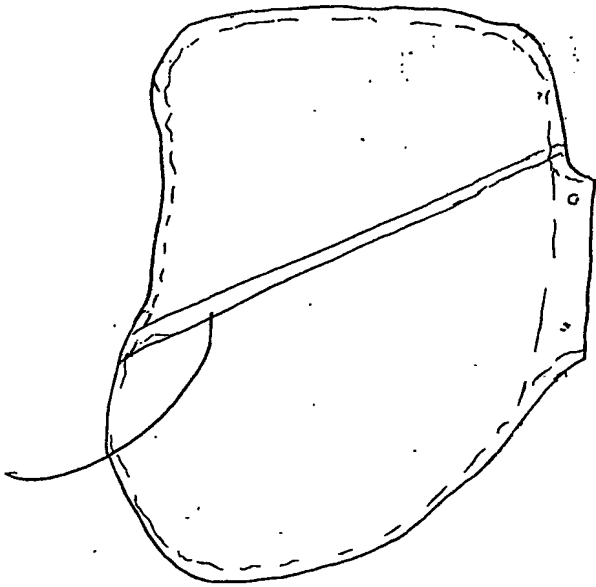


FIG 4

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☒ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**